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COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

Product Summary

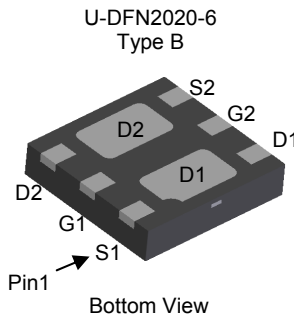
| Device | V _{(BR)DSS} | R _{DS(ON)} max | I _D MAX T _A = +25°C |
|-----------------|----------------------|---------------------------------|--|
| Q1 N-Channel | 12V | 34mΩ @ V _{GS} = 4.5V | 5.1A |
| | | 40mΩ @ V _{GS} = 2.5V | 4.7A |
| | | 50mΩ @ V _{GS} = 1.8V | 4.2A |
| | | 70mΩ @ V _{GS} = 1.5V | 3.6A |
| Q2 P-Channel | -12V | 59mΩ @ V _{GS} = -4.5V | -3.9A |
| | | 81mΩ @ V _{GS} = -2.5V | -3.3A |
| | | 115mΩ @ V _{GS} = -1.8V | -2.8A |
| | | 215mΩ @ V _{GS} = -1.5V | -2.0A |

Description

This MOSFET has been designed to minimize the on-state resistance (R_{DS(ON)}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Load Switch
- Power Management Functions
- Portable Power Adaptors

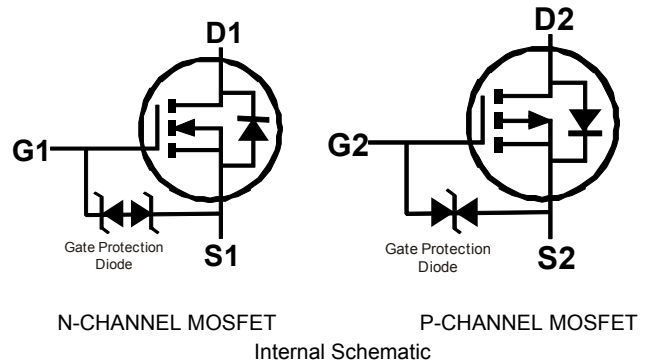


Features

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

- Case: U-DFN2020-6 Type B
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 **(e4)**
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (approximate)

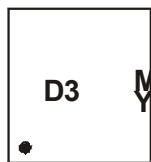


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|-----------------|--------------------|-------------------|
| DMC1030UFDB -7 | U-DFN2020-6 Type B | 3000/Tape & Reel |
| DMC1030UFDB -13 | U-DFN2020-6 Type B | 10000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



D3 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | | | | | |
|-------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|
| Code | Z | A | B | C | D | E | F | | | | | |
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Q1 N-CHANNEL | Q2 P-CHANNEL | Units |
|--|--------------|--|------------------|-----------------|-----------------|-------|
| Drain-Source Voltage | | | V _{DSS} | 12 | -12 | V |
| Gate-Source Voltage | | | V _{GSS} | ±8 | ±8 | V |
| Continuous Drain Current (Note 5) V _{GS} = 4.5V | Steady State | T _A = +25°C T _A = +70°C | I _D | 5.1 4.1 | -3.9 -3.1 | A |
| | t < 5s | T _A = +25°C T _A = +70°C | I _D | 6.6 5.3 | -5.0 -4.0 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | I _S | 2 | -1.7 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | I _{DM} | 35 | -25 | A |

Thermal Characteristics

| Characteristic | | Symbol | Value | Units |
|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5) | Steady State | P _D | 1.36 | W |
| | t < 5s | | 1.89 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R _{θJA} | 92 | °C/W |
| | t < 5s | | 66 | |
| Thermal Resistance, Junction to Case (Note 5) | | R _{θJC} | 18 | |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

Electrical Characteristics Q1 N-CHANNEL (@ T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|-----|------|---|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 12 | — | — | V | V _{GS} = 0V, I _D = 250µA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | — | — | 1.0 | µA | V _{DS} = 12V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±10 | µA | V _{GS} = ±8V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 0.4 | — | 1 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 17 | 34 | mΩ | V _{GS} = 4.5V, I _D = 4.6A |
| | | — | 20 | 40 | | V _{GS} = 2.5V, I _D = 4.2A |
| | | — | 24 | 50 | | V _{GS} = 1.8V, I _D = 3.8A |
| | | — | 28 | 70 | | V _{GS} = 1.5V, I _D = 1.5A |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1.2 | V | V _{GS} = 0V, I _S = 4.8A |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C _{iss} | — | 1003 | — | pF | V _{DS} = 6V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 132 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 115 | — | pF | |
| Gate Resistance | R _g | — | 11.3 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 12.2 | — | nC | V _{DS} = 10V, I _D = 6.8A |
| Total Gate Charge (V _{GS} = 8V) | | — | 23.1 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 1.3 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 1.5 | — | nC | |
| Turn-On Delay Time | t _{D(on)} | — | 4.4 | — | ns | V _{DD} = 6V, V _{GS} = 4.5V, R _L = 1.1Ω, R _G = 1Ω |
| Turn-On Rise Time | t _r | — | 7.4 | — | ns | |
| Turn-Off Delay Time | t _{D(off)} | — | 18.8 | — | ns | |
| Turn-Off Fall Time | t _f | — | 4.9 | — | ns | |
| Body Diode Reverse Recovery Time | t _{rr} | — | 7.6 | — | nS | I _S = 5.4A, dI/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{rr} | — | 0.9 | — | nC | I _S = 5.4A, dI/dt = 100A/µs |

- Notes:
- Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

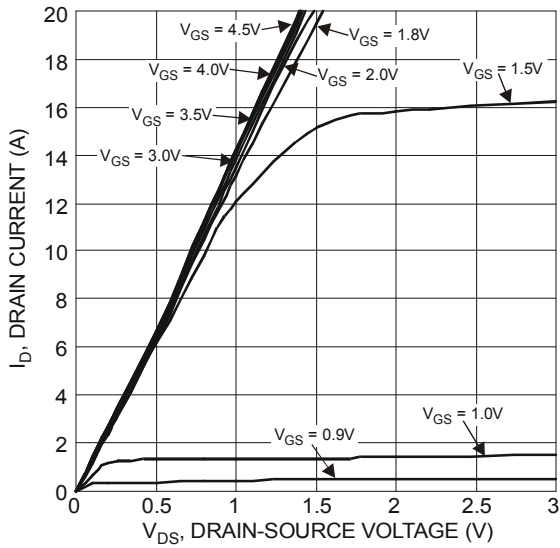


Figure 1 Typical Output Characteristics

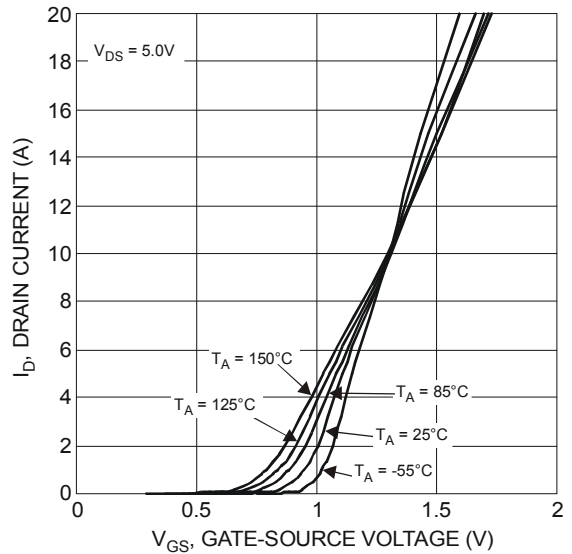


Figure 2 Typical Transfer Characteristics

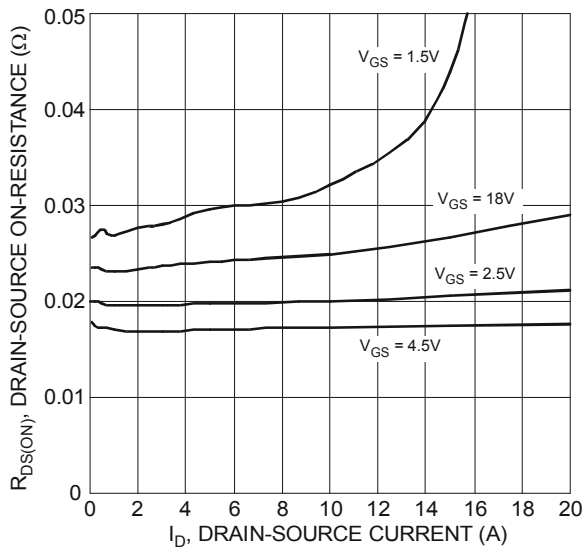


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

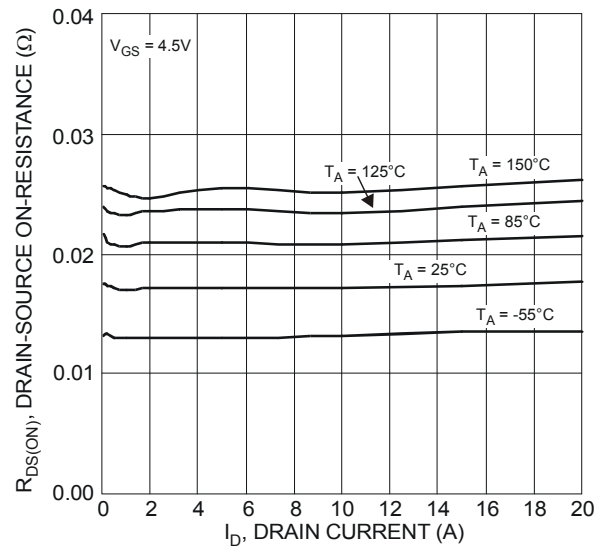


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

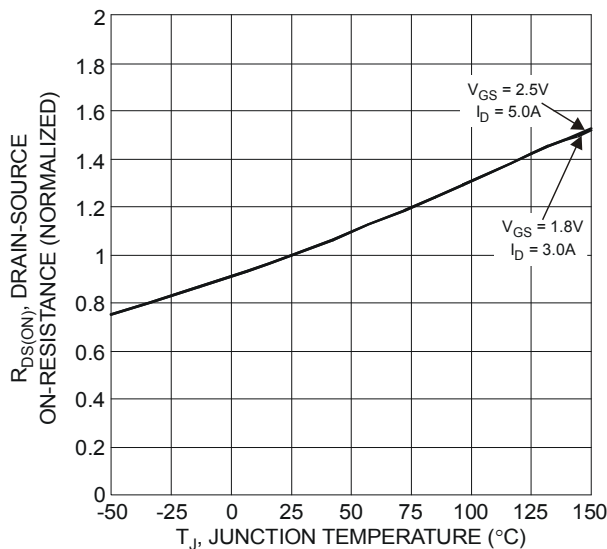


Figure 5 On-Resistance Variation with Temperature

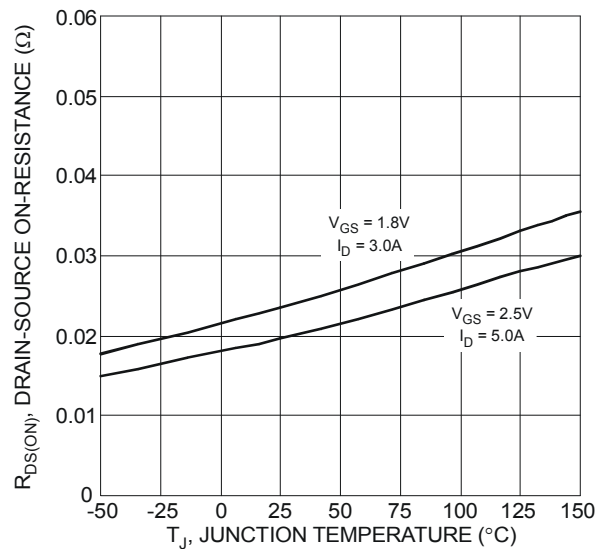


Figure 6 On-Resistance Variation with Temperature

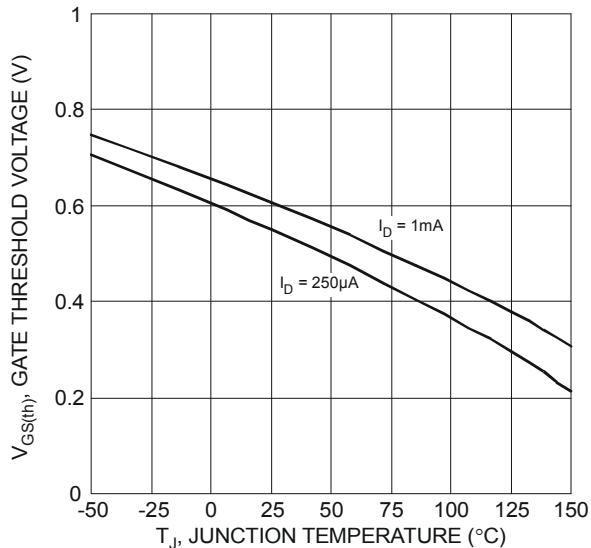


Figure 7 Gate Threshold Variation vs. Ambient Temperature

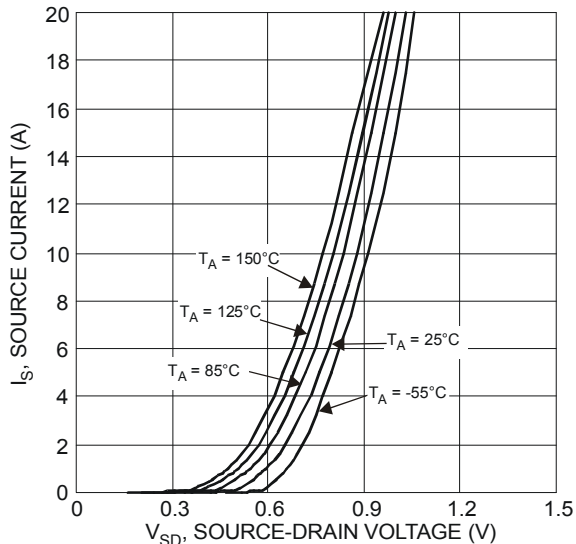


Figure 8 Diode Forward Voltage vs. Current

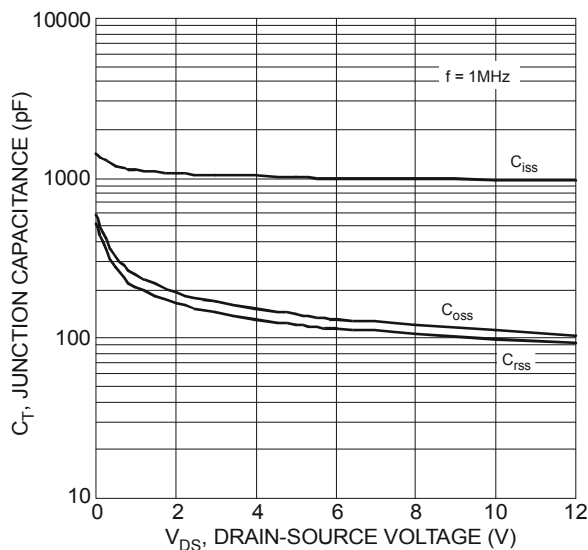


Figure 9 Typical Junction Capacitance

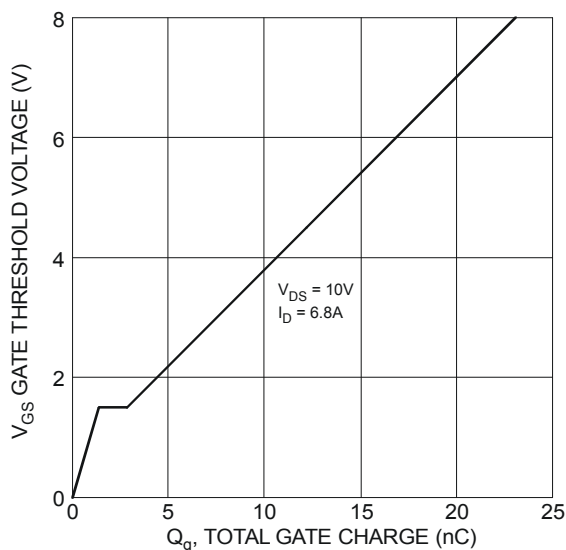


Figure 10 Gate Charge

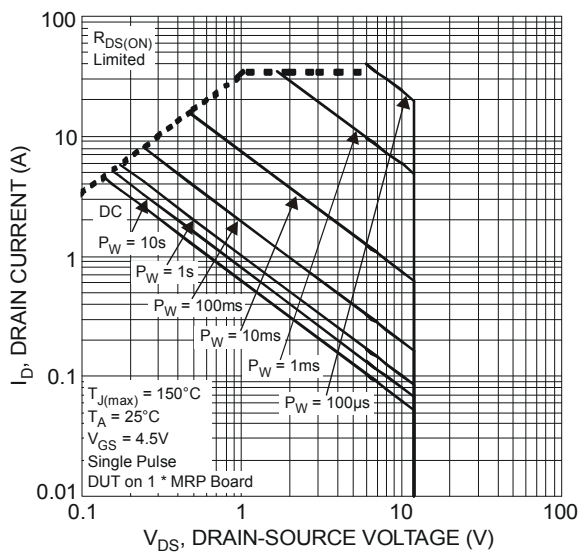


Figure 11 SOA Safe Operation Area

Electrical Characteristics Q2 P-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|------|------|----------|------------|--|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -12 | — | — | V | $V_{GS} = 0V, I_D = -250\mu A$ |
| Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$ | I_{DSS} | — | — | -1.0 | μA | $V_{DS} = -12V, V_{GS} = 0V$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 10 | μA | $V_{GS} = \pm 8V, V_{DS} = 0V$ |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.4 | — | -1 | V | $V_{DS} = V_{GS}, I_D = -250\mu A$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | 37 | 59 | m Ω | $V_{GS} = -4.5V, I_D = -3.6A$ |
| | | — | 48 | 81 | | $V_{GS} = -2.5V, I_D = -3.1A$ |
| | | — | 69 | 115 | | $V_{GS} = -1.8V, I_D = -2.6A$ |
| | | — | 88 | 215 | | $V_{GS} = -1.5V, I_D = -0.5A$ |
| | | — | — | — | | — |
| Diode Forward Voltage | V_{SD} | — | -0.7 | -1.2 | V | $V_{GS} = 0V, I_S = -3.7A$ |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C_{iss} | — | 1028 | — | pF | $V_{DS} = -6V, V_{GS} = 0V, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 285 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 254 | — | pF | |
| Gate Resistance | R_g | — | 19.6 | — | Ω | $V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$ |
| Total Gate Charge ($V_{GS} = -4.5V$) | Q_g | — | 13 | — | nC | $V_{DS} = -10V, I_D = -4.7A$ |
| Total Gate Charge ($V_{GS} = -8V$) | | — | 20.8 | — | nC | |
| Gate-Source Charge | Q_{gs} | — | 1.8 | — | nC | |
| Gate-Drain Charge | Q_{gd} | — | 4.5 | — | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 5.6 | — | ns | |
| Turn-On Rise Time | t_r | — | 12.8 | — | ns | $V_{DD} = -6V, V_{GS} = -4.5V, R_L = 1.6\Omega, R_G = 1\Omega$ |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 30.7 | — | ns | |
| Turn-Off Fall Time | t_f | — | 25.4 | — | ns | |
| Body Diode Reverse Recovery Time | t_{rr} | — | 31.6 | — | nS | $I_S = -3.6A, dI/dt = 100A/\mu s$ |
| Body Diode Reverse Recovery Charge | Q_{rr} | — | 7.8 | — | nC | $I_S = -3.6A, dI/dt = 100A/\mu s$ |

Notes: 6. Short duration pulse test used to minimize self-heating effect.
 7. Guaranteed by design. Not subject to product testing.

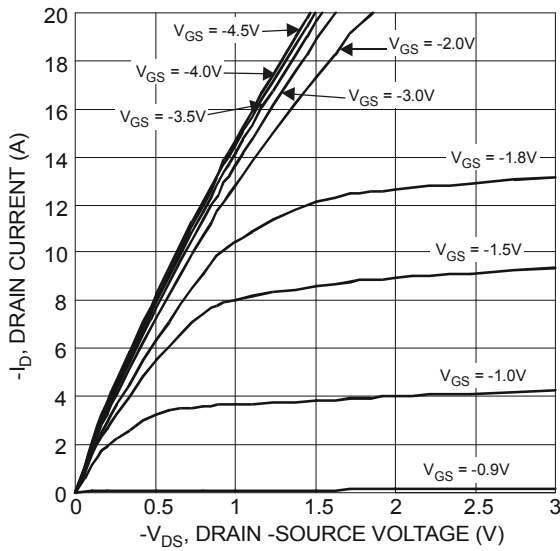


Figure 12 Typical Output Characteristics

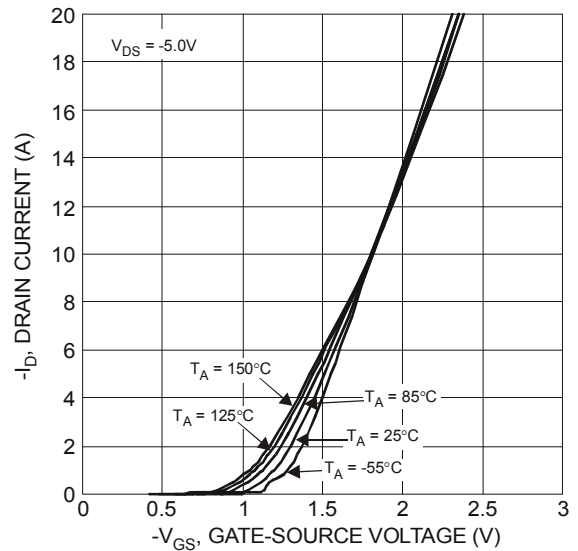


Figure 13 Typical Transfer Characteristics

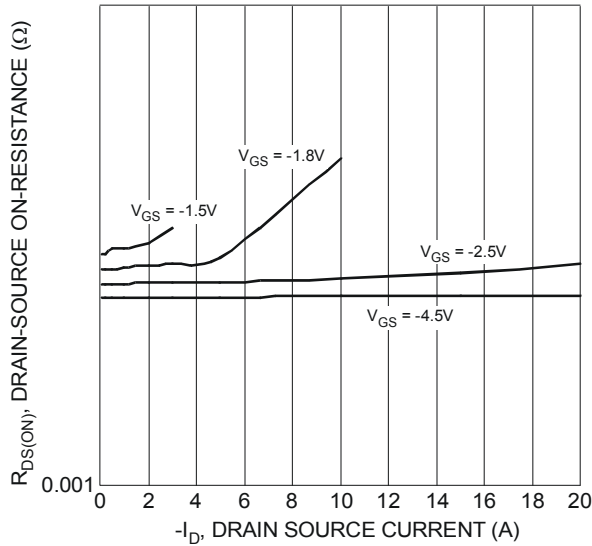


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

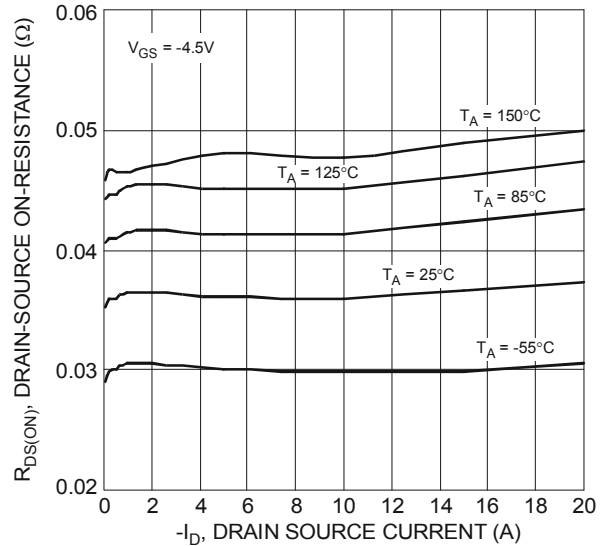


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

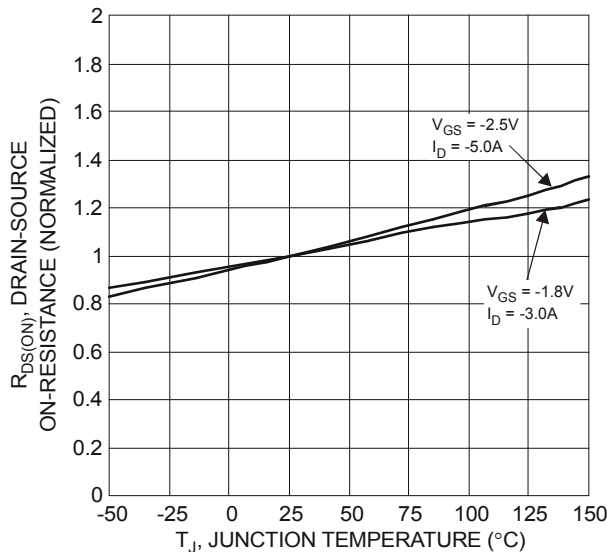


Figure 16 On-Resistance Variation with Temperature

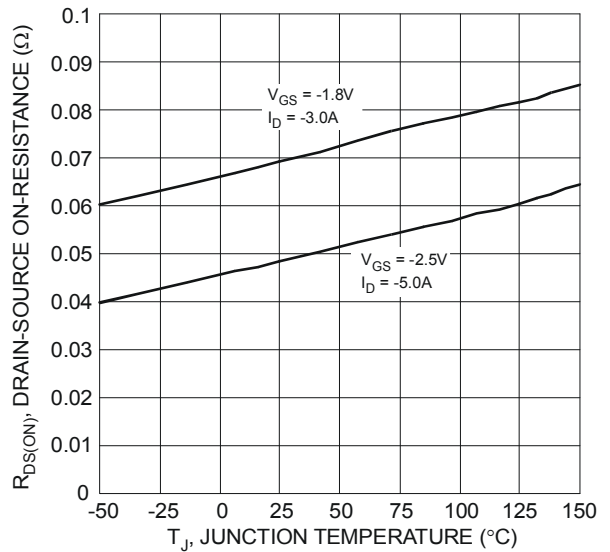


Figure 17 On-Resistance Variation with Temperature

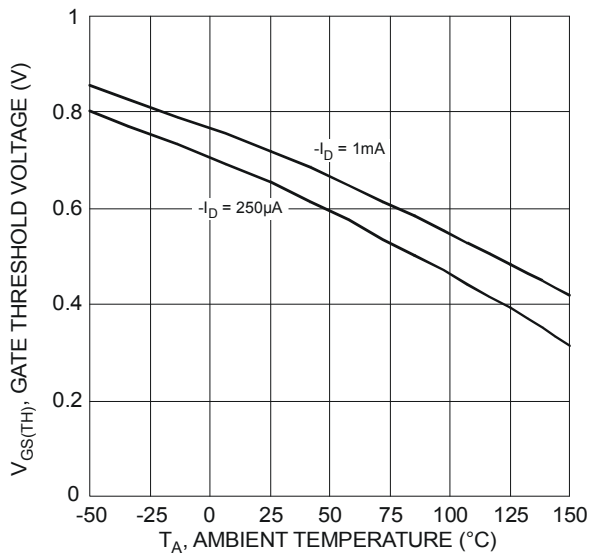


Figure 18 Gate Threshold Variation vs. Ambient Temperature

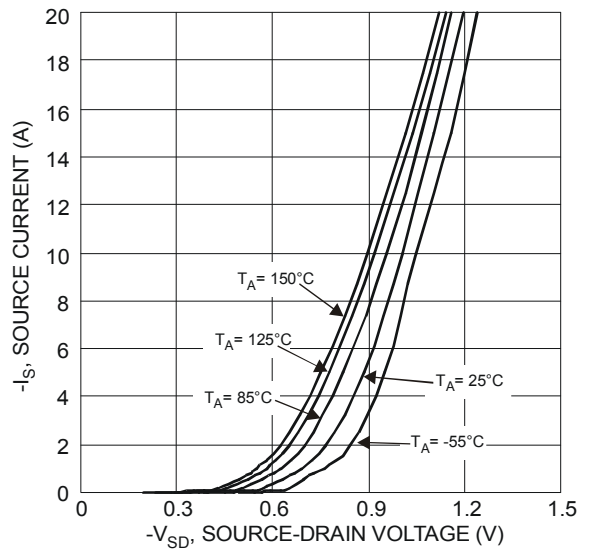


Figure 19 Diode Forward Voltage vs. Current

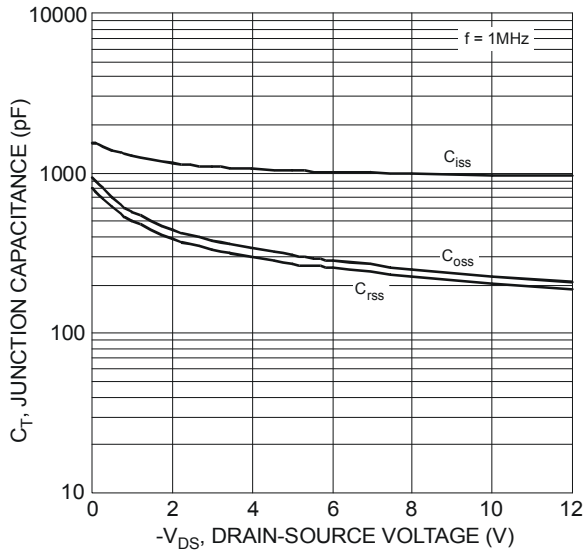


Figure 20 Typical Junction Capacitance

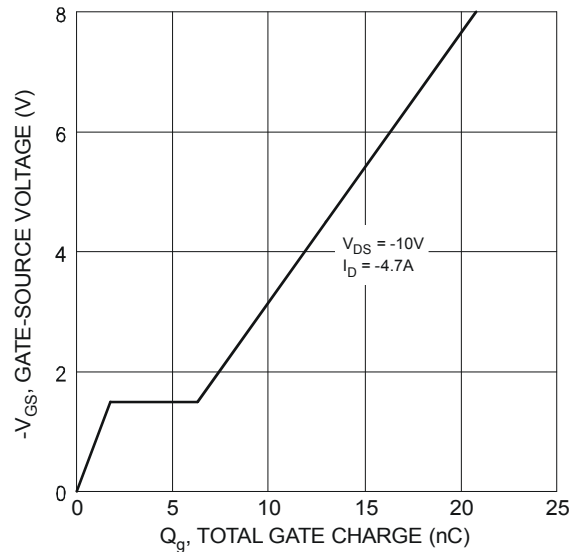


Figure 21 Gate-Charge Characteristics

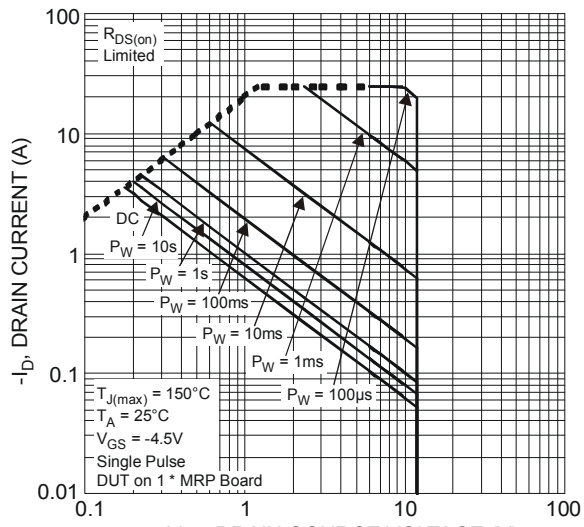


Figure 22 SOA Safe Operation Area

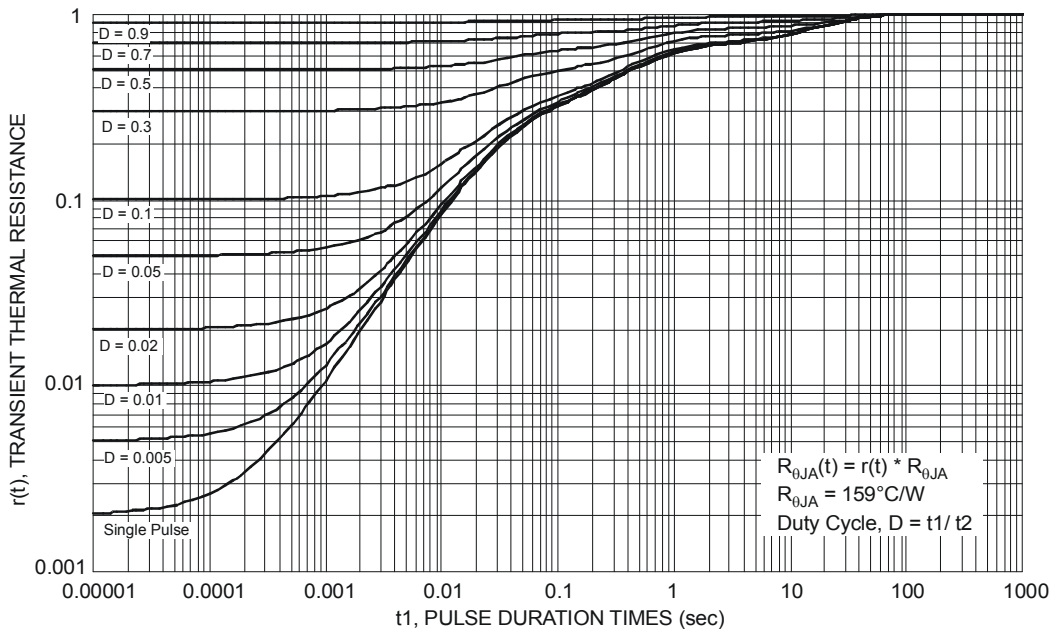
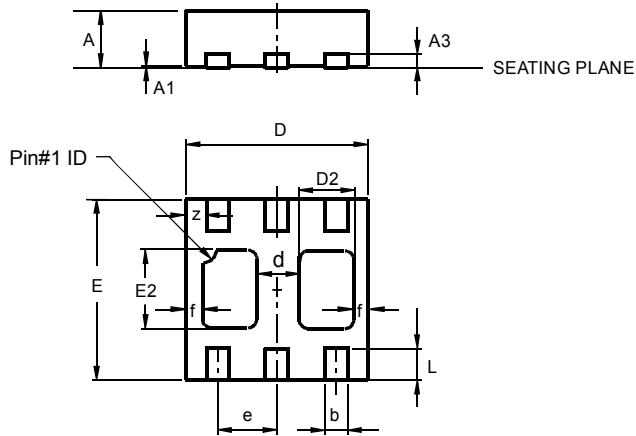


Figure 23 Transient Thermal Resistance

Package Outline Dimensions

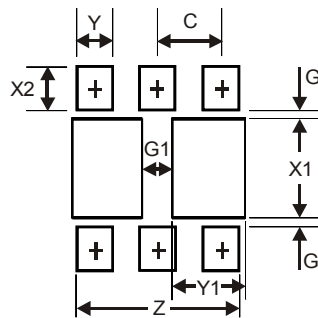
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| U-DFN2020-6 Type B | | | |
|-----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.545 | 0.605 | 0.575 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | — | — | 0.13 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.95 | 2.075 | 2.00 |
| d | — | — | 0.45 |
| D2 | 0.50 | 0.70 | 0.60 |
| e | — | — | 0.65 |
| E | 1.95 | 2.075 | 2.00 |
| E2 | 0.90 | 1.10 | 1.00 |
| f | — | — | 0.15 |
| L | 0.25 | 0.35 | 0.30 |
| z | — | — | 0.225 |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 1.67 |
| G | 0.20 |
| G1 | 0.40 |
| X1 | 1.0 |
| X2 | 0.45 |
| Y | 0.37 |
| Y1 | 0.70 |
| C | 0.65 |

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